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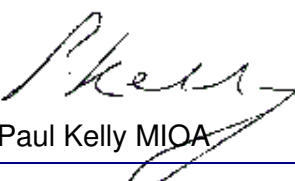
ACOUSTIC CONSULTANCY TO SUPPORT OUTLINE PLANNING APPLICATION

RESIDENTIAL DEVELOPMENT ON LAND ADJACENT TO RHOSDDU INDUSTRIAL ESTATE

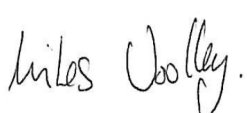


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Executive Summary

- D S Holmes Builders Limited has instructed Environoise Consulting Limited to assess the potential noise impact which may affect a proposed residential development at land adjacent to Rhosddu Industrial Estate, Gwersyllt, Wrexham.
- A partially attended noise survey was done from 15:50pm on Tuesday 13th January 2015 until 16.50hrs on Wednesday 14th January 2015 over a night-time period. This was to establish ambient and background noise levels at a location representative of proposed dwellings exposed to noise from the Rhosddu Industrial Estate and railway line.
- Attended noise surveys were conducted across the proposed site during an afternoon and morning rush hour traffic period on Tuesday 13th January 2015 and Wednesday 14th January 2015 respectively in addition to a noise measurement of Rhosddu Industrial Estate noise.
- Recommendations for glazing and ventilation strategies have been made for proposed facades to habitable rooms in particular for those most exposed to road traffic noise and industrial. Internal average noise levels will be within acceptable limits, as per Wrexham County Borough Council's (WCBC) requirements, with our recommendations for glazing and ventilation strategy.
- Outdoor garden noise levels will be sufficiently low (as suggested by WHO Guidelines) during the daytime period in the majority of the site without the need for additional noise mitigation.
- To protect garden areas with direct line of sight of Main Road from road traffic noise, a $\geq 1.8\text{m}$ high close boarded timber fence or masonry construction is proposed.
- To protect garden areas adjacent to the Rhosddu Industrial Estate from industrial noise sources, a $\geq 2\text{m}$ high close boarded timber fence in line with an existing metal palisade fence at the boundary with the Industrial Estate is proposed.
- We conclude that the site is suitable for residential purposes provided recommendations for glazing, ventilation and acoustic screening for garden areas are implemented.

1 Introduction

- 1.1.1 Environoise Consulting Limited have been instructed by McCormick Architects on behalf of their clients DS Holmes Builders Ltd to prepare a noise assessment to support an Outline planning application for a residential development at land adjacent to Rhosddu Industrial Estate, Gwersyllt, Wrexham.
- 1.1.2 The purpose of the assessment is to determine the level of noise currently affecting the site and provide recommendations for mitigation measures in order to meet Wrexham County Borough Council's (WCBC) requirements within proposed dwellings and in outdoor garden areas.
- 1.1.3 The proposal site is approximately 1.911 hectares with 50 plots proposed. It is bounded to the north by a disused railway line. To the south and west are open fields and an "in use" railway. The third side of the triangle to the southeast borders the Rhosddu Industrial Estate. The site is bound and accessed by Main Road (B5425).
- 1.1.4 A site layout plan is shown in Figure 1.

Figure 1: Proposed illustrative site layout plan



1.2 Local Authority Consultation

- 1.2.1 Consultation to determine Wrexham County Borough Council's (WCBC) noise criteria requirements was carried out with Mr. Nick Minshall, Environmental Health Officer of the Council¹. Mr. Minshall confirmed that the Council would require an assessment in accordance with Technical Advice Note 11 (TAN 11)ⁱ Noise and the guidance internal noise levels in Table 4 of BS8233 'Guidance on sound insulation and noise reduction for buildings (2014)'ⁱⁱ.
- 1.2.2 In regards to maximum noise levels, BS8233:2014 document does not include a criterion for maximum noise levels within bedrooms during the night-time period. Mr. Minshall confirmed that reference to the 45dB $L_{Amax, Fast}$ World Health Organisation 'Guidelines for Community Noise', 1999ⁱⁱⁱ night-time internal noise level criterion should be made.
- 1.2.3 In addition, Mr. Minshall required that noise associated with the adjacent Rhosddu Industrial Estate is assessed in accordance with BS4142:2014 'Methods for rating and assessing industrial and commercial sound'^{iv}.

¹ E-mails from Neil Ashton, Environoise Consulting Limited on 24th December 2014 and subsequent e-mails from Nick Minshall, Wrexham County Borough Council on 24th December 2014

2 Criteria

2.1 Technical Advice Note 11 (TAN 11) Noise

- 2.1.1 TAN 11 Noise provides guidance to local authorities on the use of their planning powers to minimize the adverse impact of noise. It introduces the concept of Noise Exposure Categories (NEC) which is intended to assist in decisions for new residential developments. The categories range from Category A which implies that noise is unlikely to be a determining factor, to Category D, which indicates that a development should be refused planning permission. See Table 1 for Noise Exposure Categories for traffic and mixed sources.

Table 1: Noise levels corresponding to NEC for new dwellings [$L_{Aeq,T}$ (dB)]

Noise Source	Period	Noise Exposure Category (NEC)			
		A	B	C	D
Road Traffic / Mixed Sources	07:00hrs – 23:00hrs	<55	55 - 63	63 - 72	>72
	23:00hrs – 07:00hrs*	<45	45 - 57	57 - 66	>66
Air Traffic	07:00hrs – 23:00hrs	<57	57 - 66	66 - 72	>72
	23:00hrs – 07:00hrs*	<48	48 - 57	57 - 66	>66

*Night-time noise levels (23.00 - 07.00): sites where individual noise events regularly exceed 82 dB L_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8h}$ (except where the $L_{Aeq,8h}$ already puts the site in NEC D).

- 2.1.2 Having measured and assessed the day and night time NEC rating of the site, the recommended action specific to applications for planning permission are tabulated in TAN 11 and reproduced in Table 2.

Table 2: Noise Exposure Category (NEC) descriptions

NEC	Determination
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

- 2.1.3 For example, an area of a site subject predominantly to road traffic noise an existing daytime noise level of less than 55 dB $L_{Aeq,16h}$ corresponds to Noise Exposure Category A. An existing night time noise level of less than 45 dB $L_{Aeq,8h}$ corresponds to Noise Exposure Category A. No noise mitigation works would normally be required at a site falling entirely into NEC A for day and night time purposes.

2.2 BS8233:2014

2.2.1 We have used guidance from BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'.

2.2.2 Table 3 below, is an excerpt of the relevant guidance in Table 4 of BS8233:2014 and presents "desirable" noise levels to be achieved in habitable spaces.

2.2.3 **Table 3:** Internal ambient noise level targets

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB L _{Aeq,16hour}	-
Dining	Dining Room/area	40dB L _{Aeq,16hour}	-
Sleeping (daytime resting)	Bedroom	35 dB L _{Aeq,16hour}	30 dB L _{Aeq,8hour}

2.2.4 Appropriate time periods for the design ranges are as follows:

- Living rooms – daytime: 07:00hrs – 23:00hrs (L_{Aeq,16 hours})
- Bedrooms – night time: 23:00hrs – 07:00hrs (L_{Aeq,8hours})

Maximum Internal Noise Levels

2.2.5 BS8233:2014 standard does not express a limit on transient maximum noise levels in bedrooms.

2.2.6 Instead it suggests that a guideline value expressed in terms of SEL or L_{Amax,fast} should be set dependent on number of events per night and the character of the noise.

2.2.7 We have therefore used guidance provided in the WHO Guidelines as follows:

- For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10–15 times per night.²

2.3 Outdoor Amenity Noise Levels

BS8233 and WHO Guidelines

2.3.1 BS8233:2014 states that "For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB L_{Aeq,T}, with an upper guideline value of 55dB L_{Aeq,T} which would be acceptable in noisier environments.". This is in line with recommendations given in the WHO Guidelines for Community Noise.

² Section 3.3 of World Health Organisation (WHO) Guidelines for Community Noise' 1999.

2.4 BS4142:2014

- 2.4.1 The impact assessment for noise from Rhosddu Industrial Estate is based on BS4142:2014 'Method for rating and assessing industrial and commercial sound'.
- 2.4.2 BS4142:2014 provides a method of determining the 'impact of specific sound' on dwellings due to industrial and commercial noise sources. The basis of the BS4142 standard is a comparison between the background noise level (LA_{90}) in the vicinity of residential locations and the rating level of the industrial noise source under consideration. The rating level ($LA_{eq,T}$) is the specific noise level plus penalties of up to 18dB added for the subjective characteristic features, tonality and impulsivity of the noise.
- BS4142 suggests that a difference between rating level and background noise level at the receptor of +5dB(A) is likely to be an indicator of **'an adverse impact, depending on the context'**.
 - A difference between rating level and background noise level at the receptor of +10dB(A) is likely to be an indicator of **'a significant impact, depending on the context'**.
 - Where the rating level of the noise source does not exceed the background noise level it is an indicator of **'a low impact, depending on the context'**.
- 2.4.3 Comment will be made, based on the above guidance, to help inform the Local Authority of the predicted impact on proposed dwellings due to the noise levels from the Rhosddu Industrial Estate.

3 Noise Survey

3.1 Survey Procedure

3.1.1 Noise level measurements were conducted between 15:50hrs on 13/01/2015 and 15:50hrs on 14/01/2014 at locations indicated in Figure 2. Positions were chosen as to be representative of dwellings most affected by noise (e.g. those fronting Main Road and those overlooking the railway line and adjacent Rhosddu Industrial Estate and also across the site.

- **Location 1:** Attended position adjacent to Main Road.
- **Location 2:** Attended position towards Paint Shop Louvre of Rhosddu Industrial Estate.
- **Location 3:** Partially attended noise monitoring position.

3.1.2 Noise measurements were conducted in accordance with BS7445-1:2003 'Description and measurement of environmental noise. Guide to quantities and procedures'v. Measurement locations are shown in Figure 2. Survey details are provided in Tables 4 and 5.

Figure 2: Noise measurement locations (shown on 'indicative' site plan)



Table 4: Details of noise measurement locations.

Location number	Sampling period (minutes)	Survey duration times	
		Start (hh:mm) (dd.mm.yyyy)	Finish (hh:mm) (dd.mm.yyyy)
1	134	16:02 (13.01.2015)	18:15 (13.01.2015)
1	182	05:58 (14.01.2015)	09:00 (14.01.2015)
2	15	16:00 (14.01.2015)	16:15 (14.01.2015)
3	1445	15:30 (13.01.2015)	15:50 (14.01.2015)

- 3.1.3 Daytime road traffic noise measurements (Location 1) and ambient and background noise level measurements (Location 3) were made in contiguous 5 minute periods. Night-time road traffic measurements (Location 1) and industrial noise measurements (Location 2) were made in contiguous 1 minute periods.

3.2 Instrumentation

Table 5: Instrumentation details

Manufacturer	Equipment type	Serial number	Date of Calibration
Rion	NC-74 calibrator with ½" adaptor	34904967	20 th May 2014
	NA-28 sound level meter	01070574	
	NH-23 preamplifier	70591	25 th June 2014
	UC-59 Microphone	00380	
Rion	NA-28 sound level meter	00501401	5 th December 2014
	NH-23 preamplifier	01440	15 th July 2014
	UC-59 Microphone	03881	
	NC-34 calibrator with ½" adaptor	34904967	

Calibration

- 3.2.1 The sound level meters were calibrated at the start and end of the noise surveys, there was no recorded drift greater than 0.3dB at 1 kHz. Therefore measurements are considered suitable.

Weather Conditions

- 3.2.2 Weather conditions were suitable for the noise survey.

- **Start of survey:** 60-80% dry, damp roads, still, 3°C. (13th January 2015)
- **End of survey:** 100% dry, damp roads, breeze, 6°C. (14th January 2015)

4 Noise Survey Results

4.1 Noise Results

A summary of measured noise levels are summarised in Tables 6 and 7. Other noise level data is available upon request.

Table 6: Measured noise levels from mixed noise sources.

Location	Total sampling period (minutes)	Night-time maximum noise level (L _{Amax,fast}) dB range	Ambient noise level dB (L _{Aeq,T}) range		Background noise level dB (L _{A90,T}) range	
			Daytime	Night-time	Daytime	Night-time
1	316	51 - 82	60 - 73	43 - 68	50 - 65	39 - 53
3	1445	46 - 73	41 - 67	45 - 59	44 - 54	43 - 47

Table 7: Measured noise levels from Rhosddu Industrial Estate

	Total sampling period (minutes)	Ambient noise level dB (L _{Aeq,T})	Background noise level dB (L _{A90,T})
2	15	53	52

- 4.1.1 The logarithmically averaged daytime and night-time ambient noise levels obtained from Locations 1 and 3 is presented in Table 8. The highest night-time maximum noise level not exceeded more than 15 times during the measurement (see section 2.2.7) is presented in Table 8 as these are pertinent to the assessment. Other data is available on request.

Table 8 Measured ambient noise levels

Location	Period	L _{eq,T} at octave band centre frequency (Hz)							L _{Aeq, T} (dB)
		63	125	250	500	1k	2k	4k	
1	Daytime	45	50	54	58	65	63	55	68
	Night-Time	42	45	49	53	59	57	49	62
3	Daytime	60	54	48	46	48	41	35	51
	Night-time	49	44	40	39	40	33	49	43

Table 9: Measured highest maximum noise levels

Location	Period	L _{max(fast)} at octave band centre frequency (Hz)							L _{Amax(fast)} (dB)
		63	125	250	500	1k	2k	4k	
1	Night-time (06:00 – 07:00)	85	78	79	75	72	69	65	77
3	Night-time (23:00 – 07:00)	77	59	8	45	42	32	14	54

4.2 Discussion

Ambient Noise Levels

- 4.2.1 We noted from our visit to the proposal site that road traffic noise from New Road (Location 1) dominates the north-east of the site during the daytime (07.00 – 23.00hrs) and night-time (23.00 – 07.00hrs) period. Use of Main Road by vehicles during the night-time period was noted to be lower.
- 4.2.2 Towards the south of the site, rail traffic noise from the railway line (Location 3) dominates the south of the site during train pass-by's. Between pass-bys, noise from Main Road and Rhosddu Industrial Estate dominates.
- 4.2.3 The dominant noise from Rhosddu Estate was noted to be from an extract vent associated with a paint factory. Noise from this was generally continuous and relatively low level (i.e. 51dB L_{Aeq, T}) throughout the daytime hours only. Therefore a noise impact assessment in accordance with BS4142 has been carried out for comment to inform WCBC.
- 4.2.4 Other industrial type activities were from a haulier site. However, vehicle movements were noted to be infrequent.

Maximum Noise Levels

- 4.2.5 A night-time maximum noise level (not occurring more than 15 times, see section 2.2.6) of 77dB L_{Amax,fast} was measured at Location 1 and will be used for the assessment of noise within proposed dwellings exposed to noise from Main Road.
- 4.2.6 The highest night-time maximum noise level (not occurring more than 15 times, see section 2.2.6) of 54dB L_{Amax,fast} was measured at Location 3 and will be used for the assessment of noise within proposed dwellings overlooking the railway line and Rhosddu Industrial Estate.

Background Noise Levels

- 4.2.7 Measured background noise levels (Location 3) were due to distant road traffic and extract vent noise from Rhosddu Industrial Estate. The lowest background noise level measured during the night-time period was 43dB L_{A90,5mins}. This will be used for the assessment of noise from the Rhosddu Industrial Estate.

5 TAN 11 Assessment

- 5.1.1 As detailed in Table 10, the arithmetically averaged daytime 16-hour and night-time 8-hour noise levels are 50 and 40dB $L_{Aeq,T}$ respectively.
- 5.1.2 Table 10 compares these values with the Noise Exposure Categories (NEC) from TAN 11, listed in Section 3.1.

Table 10: TAN 11 Assessment

Noise Source	Period	Noise Level (dB $L_{Aeq,T}$)	NEC Category
Mixed Sources	Daytime (07.00 – 23.00hrs)	50	A
	Night-time (23.00 – 07.00hrs)	40	A

It can be seen in Table 10 that the site falls into NEC category A during the daytime and night-time.

- 5.1.3 Tan 11 states that where a site falls into category 'A':

Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.

- 5.1.4 Mitigation measures in order to provide a commensurate level of protection against noise have been recommended. These centre on the glazing and ventilation strategy and mitigation for garden areas .

6 Noise Ingress Assessment

6.1 Overview

- 6.1.1 Generally it is accepted that glazing and ventilation openings within external façades will be the weakest elements acoustically when compared to robust external and roof constructions. Therefore, specifying glazing and ventilation this is sufficiently robust to attenuate the highest levels of noise will provide an excellent acoustic environment – any supplementary attenuation offered by the more substantial construction of the structural façade (e.g. masonry) would serve to further reduce internal noise levels.
- 6.1.2 Noise ingress levels have been calculated considering the measured ambient and maximum noise levels detailed in Tables 6, 7, 8 and 9, propagation of sound across the site and assessment method given in BS EN 12354-3:2000^{vi} to determine the required performance of glazing and ventilation strategy to meet Local Authority Criteria and provide recommendations. A reverberation time of 0.5 seconds has been used for all living rooms and bedrooms.
- 6.1.3 Details of constructions (including rooms sizes and window areas) have been assumed as follows:
- External wall comprising brick / cavity / block or brick / cavity / timber stud and plasterboard lining.
 - Typical living room dimensions will be 5m x 4m x 2.4m (h) and glazing areas will be 3m².
 - Typical bedroom dimensions will be 4m x 4m x 2.4m (h) and glazing areas will be 2m².
- 6.1.4 All ingress calculations assume background ventilation will be provided trickle vents / wall vents. We have assumed that opening windows are not part of the ventilation strategy but to provide additional ventilation through user discretion. An open window will typically provide between 10 to 15dBA attenuation from outside to inside according to BS8233:2014 meaning internal noise targets would be exceeded. The level of attenuation will depend on the free open area of the window and the angle of the window relative to the dominant external noise source.

7 Façade Recommendations

7.1 Glazing & Ventilation

7.1.1 We consider that suitable glazing and ventilation attenuation can be provided to habitable rooms, such that internal average noise levels would be within acceptable limits, as per Local Authority guidelines.

7.1.2 Glazing and ventilation specifications have been given see Table 11. Locations of recommended glazing and ventilation specifications are shown in Appendix B, Figure 3.

Table 11: Recommended minimum specifications (refer to Appendix B).

Facade	Minimum glazing performance $\geq R_w$ (dB)	Typical Glazing specification	Minimum trickle / wall vent performance $\geq D_{new}$ (dB)	Example Trickle / Wall Vent
1	40	Pilkington 10mm pane / 12mm cavity / 6.4mm laminated pane glazed unit	39	Renson AK35 trickle vent
2	31	Pilkington 6mm pane/ 12mm cavity/ 6 mm pane glazed unit	31	Titon Trim Vent 90 trickle vent

Glazing Performance

7.1.3 Glazing with a larger air or inert gas (e.g. Argon) cavity is acceptable providing both recommended pane thicknesses remain the same. Laminated glazing in place of traditional glazing is acceptable providing it is the same thickness. The glazing performance should be constant across the overall assembly, so the framing should be of similar or greater performance than the glazing recommended. The performance of the glazing units will depend on quality of framing and good contact with window seals.

7.1.4 The sound insulation of a window is usually measured over a wide range of frequencies from low to high in accordance with BS EN ISO 140-3: 1995, but it is often convenient for specifiers to represent the insulation by a single figure, see below:

- R_w , the weighted sound reduction, more useful, as it incorporates a correction for the response of the human ear.
- $R_w + C_{tr}$ is the weighted sound reduction with a low frequency spectrum adaptation term (C_{tr} is usually a negative number) suitable for urban traffic noise and low speed rail traffic³.
- R_{TRA} , the weighted reduction against typical low speed urban road traffic noise.

³ The C_{tr} adaption term was introduced in BS EN ISO 717-1: 1997 'Acoustics - Rating of sound insulation in buildings and building elements Part 1'

Ventilation

- 7.1.5 The ventilation opening and free area of proposed trickle units should be checked by a mechanical services engineer before installation. Should the equivalent open area be insufficient to meet the minimum requirements of Part F of the Building Regulations, it may be necessary to provide more than one unit per habitable room. In this case, vents with higher sound insulation performances than those recommended in Table 9 may need to be specified depending on the proposed number of units.
- 7.1.6 Where mechanical ventilation is to be installed, noise criteria will be met in habitable rooms with the proposed glazing in Table 11.

8 Outdoor Amenity Spaces

- 8.1.1 Guidance given in BS8233 and the WHO Guidelines for Community Noise states that it is desirable for the steady noise level in external amenity spaces (such as gardens, balconies or outdoor living areas) to be less than 50dB $L_{Aeq,16hour}$ to prevent moderate annoyance with 55dB $L_{Aeq,16hour}$ regarded as an upper limit in order to prevent serious annoyance for occupants.
- 8.1.2 Outdoor amenity spaces within the proposed development include garden areas to the rear of proposed dwellings.
- 8.1.3 Measurements at Location 3 indicates that for the majority of the site, gardens would be exposed to noise levels at or below 50dB $L_{Aeq,16hour}$ above which moderate annoyance would occur.
- 8.1.4 Measurements at Location 1 indicates that for gardens fronting Main Road, noise levels would be in excess of the 55dB $L_{Aeq,16hour}$ targets above which serious annoyance would occur.
- 8.1.5 Measurements at Location 2 indicates that for the area of site adjacent Rhosddu Industrial Estate, gardens would be exposed to noise levels above 50dB $L_{Aeq,16hour}$ above which moderate annoyance would occur.
- 8.1.6 Calculations (see Appendix C, Figure 4) indicate that noise levels in gardens fronting Main Road will be below 55dB $L_{Aeq,16hour}$ with a ≥ 2.4 m high close-boarded timber fence (minimum surface mass of 12kg/m²) installed at the boundary with Main Road (see Appendix B). This would provide approximately 14dB of attenuation of noise in garden areas.
- 8.1.7 Alternatively, we recommend that gardens are provided to the rear of houses (i.e. away from Main Road) so that they benefit from the shielding effect that will be offered by the houses themselves. With the installation of perimeter close boarded fencing around other gardens, noise levels will be further reduced.
- 8.1.8 To reduce noise levels in gardens adjacent to Rhosddu Industrial Estate to below the 50dB $L_{Aeq,16hour}$ lower limit value, we recommend that a ≥ 2 m high close-boarded timber fence (minimum surface mass of 12kg/m²) is installed following the line of the existing metal palisade fence at the boundary of the site with Rhosddu Industrial Estate (indicated in Appendix B). See Appendix C, Figure 5 for calculations).
- 8.1.9 Calculations (see Appendix C, Figure 5) indicate that noise levels in gardens adjacent Rhosddu Industrial Estate will be below the 50dB $L_{Aeq,16hour}$ value with a ≥ 2 m high close-boarded timber fence (minimum surface mass of 12kg/m²) installed following the line of the existing metal palisade fence at the boundary of the site with Rhosddu Industrial Estate (see Appendix B). This would provide approximately 7dB of attenuation of noise in garden areas.
- 8.1.10 Detailed consideration of noise levels in outdoor amenity areas should be made at the Reserved Matters application stage once the layout of the site has been fixed.

9 Noise Impact Assessment

9.1 Industrial Noise – Rhosddu Industrial Estate

- 9.1.1 Specific noise levels from the Rhosddu Industrial Estate measured at Location 2 were 53dB $L_{Aeq,15minutes}$. Subjective assessment of the noise at this location during the day indicated the noise was associated primarily with an extract vent of a paint factory. The noise was continuous and broadband in nature and was audible across the south eastern side of the site. This became more noticeable closer to the eastern boundary.
- 9.1.2 An assessment in accordance with BS4142:2014 has been carried out requested by WCBC. BS4142 generally applies where a new industrial noise source is proposed to existing noise sensitive receptors, in this case the reverse is true. Therefore an assessment to BS4142 has been included for comment only.
- 9.1.3 The master plan currently indicates that the residential dwellings will be separated by a line of trees screening the Industrial Estate.
- 9.1.4 Due to the continuous broadband nature of the noise from the site, a penalty has not been added to the measured noise level of 53dB $L_{Aeq,15minutes}$ at Location 2 in accordance with BS4142:2014. The lowest measured background level at Location 3 was 43dB $L_{A90,5mins}$. The calculated difference between the two levels is +10dB (i.e. 53-43dB).
- 9.1.5 Using the guidance in BS4142:2014, this difference is “likely to be an indication of a significant adverse impact, depending on the context”.

Context

- 9.1.6 It should be noted that this is a proposed residential site adjacent to an existing industrial noise source for which BS4142:2014 does not strictly apply. In addition, noise levels from the Rhosddu Industrial Estate are relatively low when compared to road and rail traffic noise levels across the site. We therefore consider that noise from the site will have a negligible adverse impact on proposed dwellings providing that our recommendations for glazing, ventilation and boundary fencing are implemented.

10 Conclusions

10.1 Noise Assessment

- 10.1.1 A noise survey has been conducted at the proposed site at locations considered to be most affected by noise sources (i.e. road traffic along Main Road, rail traffic and industrial noise from Rhosddu Industrial Estate).
- 10.1.2 Noise levels at the site are such that internal noise level targets can be achieved by means of an appropriate glazing and ventilation strategy for proposed dwellings.

10.2 Facades facing Main Road

- 10.2.1 For facades facing Main Road, the following strategy has been recommended:
- 39dB $D_{ne,w}$ trickle ventilation units and 40dB R_w double glazed window units are required to facades overlooking Main Road to meet 'desirable' internal noise levels in habitable spaces during the daytime (07.00hrs – 23.00hrs) and night-time (23.00hrs – 07.00hrs) period.

10.3 All other Facades

- 10.3.1 For all other facades the following strategy has been recommended:
- 31dB $D_{ne,w}$ trickle ventilation units and 31dB R_w double glazed window units are acceptable for all other facades for 'desirable' internal noise levels in habitable spaces during the daytime (07.00hrs – 23.00hrs) and night-time (23.00hrs – 07.00hrs) period.

10.4 Outdoor Amenity Spaces

- 10.4.1 BS8233 and WHO Guideline target values for garden areas will be met in the majority of locations without further mitigation measures.
- 10.4.2 To protect gardens areas at the boundary with Main Road we recommend a ≥ 2.4 m high close boarded timber fence or alternatively the location of gardens away from Main Road to the rear of associated houses.
- 10.4.3 To protect garden areas at the boundary with Rhosddu Industrial Estate, we recommend a ≥ 2 m high close boarded timber fence in line with the existing metal palisade fencing.
- 10.4.4 Detailed consideration of this should be made at the Reserved Matters application stage once the layout of the site has been fixed.

References

- ⁱ Technical Advice Note (TAN) 11: Noise (1997).
- ⁱⁱ BS8233: 'Guidance on sound insulation and noise reduction for buildings' (2014).
- ⁱⁱⁱ World Health Organisation (WHO) Guidelines for Community Noise', 1999.
- ^{iv} BS4142: 'Methods for rating and assessing industrial and commercial sound' (2014).
- ^v BS7445-1:2003 'Description and measurement of environmental noise. Guide to quantities and procedures'.
- ^{vi} BS EN 12354-3:2000 Building acoustics. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound.

Appendix A: Acoustic Terms

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascal, Pa). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB (A). The following lists the sound pressure level in dB (A) for common situations.

Table A1: Noise levels for common situations

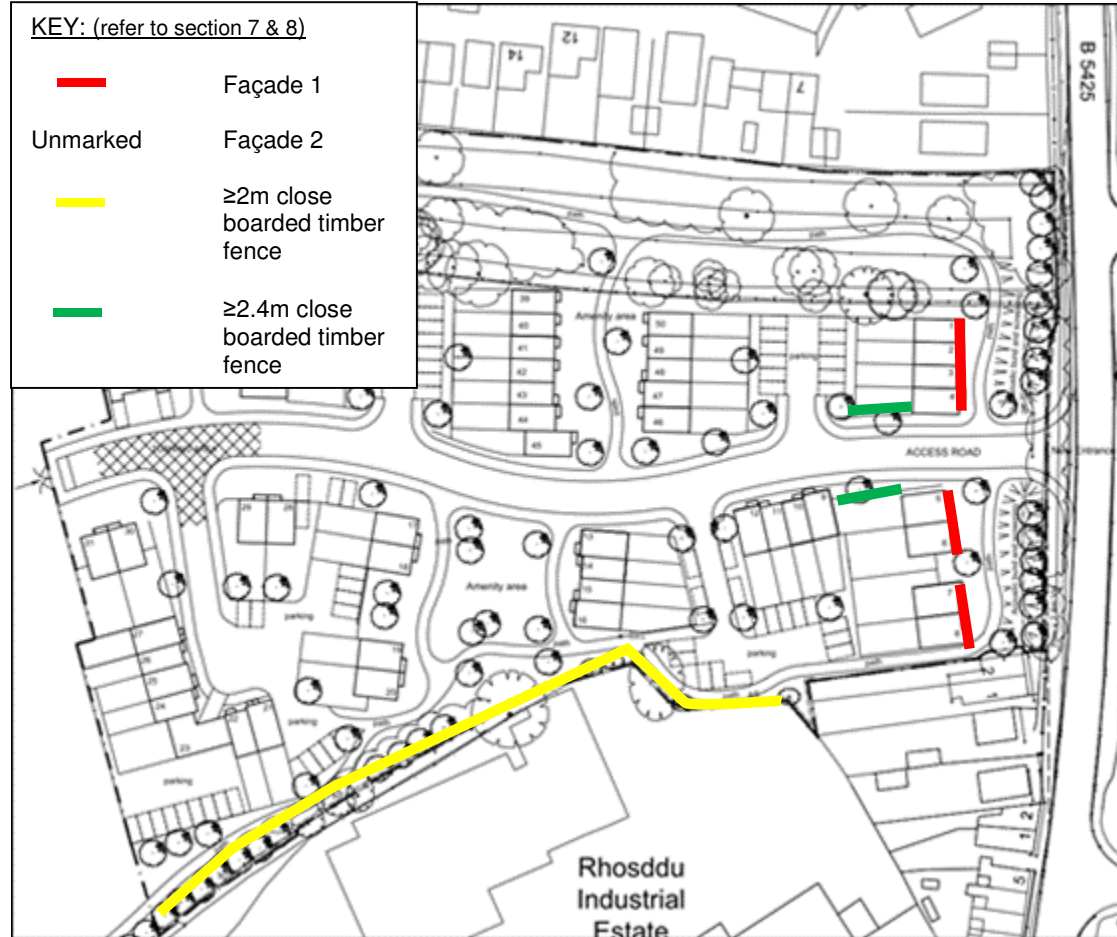
Typical noise level dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library, refrigerator humming at 2m
50	Quiet office, no machinery Boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m Vacuum cleaner at 3m
80	General factory noise level Heavy goods vehicle from pavement
90	Powered lawn motor, operators ear
100	Pneumatic drill at 5m
120	Discotheque – 1m in front of loudspeaker
140	Threshold of pain

The noise levels at a measurement point are rarely steady, even in rural areas, and vary over a range dependent upon the effects of local noise sources. Close to a busy motorway, the noise levels may vary over a range of 5 dB(A), whereas in a suburban area this may increase up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time noise levels will often be smaller and the levels significantly reduced compared with daytime levels. When considering environmental noise, it is necessary to consider how to quantify the existing noise (the ambient noise) to account for these second to second variations.

Human subjects are generally only capable of noticing changes in steady levels of no less than 3 dB(A). It is generally accepted that a change of 10 dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level. (These findings do not necessarily apply to transient or non-steady noise sources such as changes in noise due to change in road traffic flow, or intermittent noise sources). The equivalent continuous A-weighted sound pressure level, L_{Aeq} , is the single number that represents the average sound energy measured over that period. The L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. It is commonly used to express the energy value from individual sources that vary in level over their operational cycle.

Appendix B: Façade Recommendations

Figure 3: Recommended glazing, ventilation and barrier locations



Appendix C: Barrier Calculations

Figure 4: Barrier calculation for gardens fronting Main Road

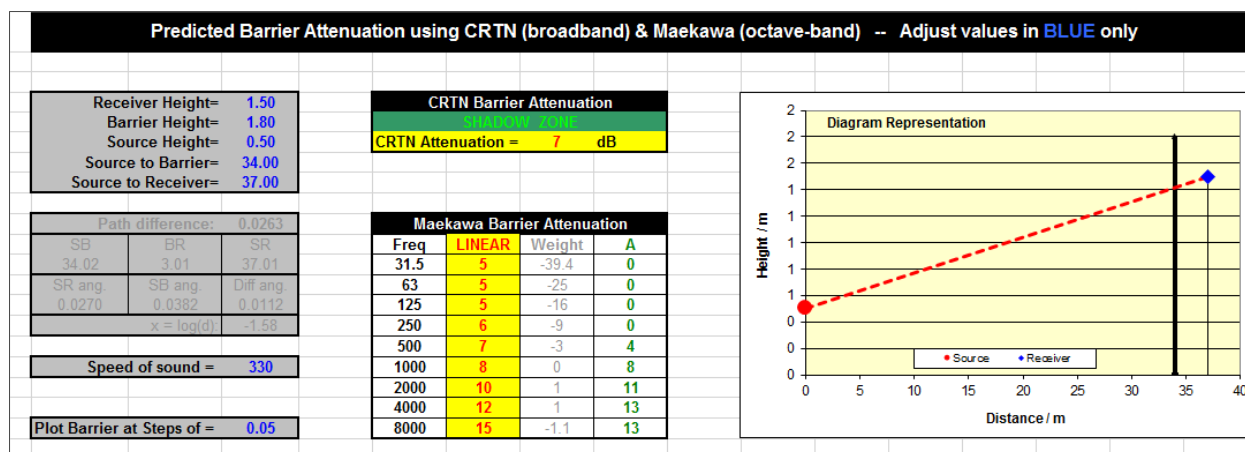


Figure 5: Example barrier calculation for gardens adjacent Rhosddu Industrial Estate

